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### (54) PACKAGING CONTAINER SEALING APPARATUS

VORRICHTUNG ZUM VERSCHLIESSEN VON VERPACKUNGSBEHÄLTERN

APPAREIL DE FERMETURE ETANCHE D'UN CONTENEUR D'EMBALLAGE

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**Description****TECHNICAL FIELD**

The present invention relates to a sealing apparatus for packaging containers.

**BACKGROUND ART**

Conventionally, various types of packaging containers having different shapes have been used for liquid foods such as soft drinks and milk. One such packaging container is a gable-top type packaging container which has a roof-shaped top. When the gable-top type packaging container is used, a carton blank is first formed into a square tubular carton by a filling machine, and a spout is then attached to the carton. The bottom end of the carton is then sealed by mandrels to make a bottom. A liquid food is then placed in the carton having a bottom through the top opening thereof.

After the liquid food has been placed in the carton, the top portion of the carton is folded along predetermined pleat lines, and is then sealed.

FIG. 1 is a side view of a square tubular carton which is used for forming a gable-top type packaging container, FIG. 2 is a side view of a packaging container, and FIG. 3 is a perspective view of a packaging container.

In these drawings, numeral 11 denotes a square tubular carton made of a packaging material, and numeral 12 denotes a spout attached to a predetermined position of the carton 11.

A plurality of pleat lines a through f are formed on the square tubular carton 11. The carton is folded along the pleat lines a through f to form a triangular panel 15, folding panels 16, inner sealing fins 17, outer sealing fins 18, and slanting roof panels 19. After the carton is folded along the pleat lines a through f, each pair of sealant layers of the inner sealing fins 17 facing each other is fused while each pair of sealant layers of the outer sealing fins 18 facing each other is also fused, thereby forming a packaging container 13.

For such a manufacturing process, it has been proposed to utilize ultrasonic waves for fusing and joining each pair of sealant layers (see e.g. GB-A-2 017 041). Fig. 4 is a diagram showing the operation of a sealing apparatus for packaging containers in which ultrasonic waves are utilized.

In Fig. 4, numeral 13 denotes a packaging container, and numeral 21 denotes a sealing fin portion composed of the aforementioned inner sealing fins 17 and outer sealing fins 18 (see Fig. 1). Numeral 22 denotes a horn of an ultrasonic sealing head while numeral 23 denotes an anvil disposed in front of the horn 22.

When the horn 22 is advanced to its advanced position, the sealing fin portion 21 is pressed by the horn 22 toward the anvil 23 while receiving ultrasonic vibration from the horn 22, so that each pair of opposing sealant

layers is fused and joined. In this method, sealant layers can be directly heated by ultrasonic vibration without heating the paper substrate. This facilitates adjustment of the heating conditions, and increases stability of joining.

However, when ultrasonic vibration is transmitted from the horn 22 to the sealing fin portion 21, the edge portion 25 of the sealing fin portion 21 vibrates. Since an end surface of the paper substrate is exposed to the outside at the edge portion 25, dust is produced from the end surface of the paper substrate, and the dust flies around. Therefore, a problem exists that the dust is mixed into a liquid food being filled in the packaging container.

An object of the present invention is to solve the above-mentioned problems in the conventional sealing apparatus for packaging containers and to provide an improved sealing apparatus for packaging containers which does not produce dust from an end surface of a paper substrate, which dust would otherwise fly around.

**DISCLOSURE OF THE INVENTION**

To achieve the above object, a sealing apparatus for packaging containers according to the present invention can be applied to production of a gable-top type packaging container in which a square tubular carton is folded along pleat lines, and each pair of sealant layers of a sealing fin portion facing each other is fused for sealing, whereby the gable-top type packaging container is formed.

The sealing apparatus according to the present invention includes an anvil for supporting a sealing fin portion, a horn composed of a columnar portion and a converging portion, and means for pressing the sealing fin portion against the anvil through the tip of the horn and for transmitting ultrasonic vibration to the sealing fin portion. The horn transmits the ultrasonic vibration to the packaging material, thereby fusing each pair of sealant layers of the sealing fin portion to effect sealing. The apparatus is characterized in that there is provided ultrasonic vibration absorbing means disposed such that, in use, it is located between the tip of the horn and the free edge portion of the sealing fin portion and in contact with said sealing fin portion for absorbing ultrasonic vibration.

When ultrasonic vibration is transmitted to the sealing fin portion, the sealing fin portion is excited to transmit the vibration toward the edge portion. However, since the vibration is absorbed by the ultrasonic vibration absorbing means, the vibration does not reach the edge portion. Accordingly, it is possible to prevent the generation of dust from an end surface of the paper substrate which is exposed to the outside at the edge portion of the sealing fin portion.

In a preferred sealing apparatus for packaging containers according to the present invention, the ultrasonic vibration absorbing means is a projection which is

formed on the anvil for holding a packaging material in cooperation with the tip of the horn. In this case, since ultrasonic vibration is absorbed by the anvil through the projection, the ultrasonic vibration is not transmitted to the edge portion of the sealing fin portion.

In still another embodiment of the sealing apparatus for packaging containers according to the present invention, the ultrasonic vibration absorbing means is an outside pusher which is disposed along the tip portion of the horn and which is pressed against the sealing fin portion.

In this case, since ultrasonic vibration is absorbed by the outside pusher, the ultrasonic vibration is not transmitted to the edge portion of the sealing fin portion.

In yet another embodiment of the sealing apparatus for packaging containers according to the present invention, the aforementioned outside pusher has a tubular portion surrounding the horn, and a support member which inwardly extends from the tubular portion for supporting the horn. The tip of the support member contacts a portion corresponding to a node of the standing wave of ultrasonic vibration transmitted to the horn.

Accordingly, the ultrasonic vibration transmitted to the horn is prevented from being transmitted to the outside pusher via the support member.

#### BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a side view of a square tubular carton which is used for forming a gable-top type packaging container; FIG. 2 is a side view of a packaging container; FIG. 3 is a perspective view of a packaging container; FIG. 4 is a diagram showing a sealing operation for packaging containers in which ultrasonic waves are utilized; FIG. 5 is a schematic view of a sealing apparatus for packaging containers according to a first embodiment of the present invention; FIG. 6 is a sectional view taken along line X-X in FIG. 5; FIG. 7 is a schematic view of a main portion of a sealing apparatus for packaging containers according to a second embodiment of the present invention; and FIG. 8 is a schematic view of a main portion of a sealing apparatus for packaging containers according to a third embodiment of the present invention.

#### BEST MODE FOR CARRYING OUT THE INVENTION

The embodiments of the present invention will now be described in detail with reference to the drawings.

FIG. 5 is a schematic view of a sealing apparatus for packaging containers according to a first embodiment of the present invention, and FIG. 6 is a sectional view taken along line X-X in FIG. 5.

In the drawings, numeral 13 denotes a packaging container made of a packaging material, and numeral 21 denotes a sealing fin portion composed of inner sealing fins 17 (see FIG. 1) and outer sealing fins 18. The

packaging material includes a paper substrate, and a polyethylene layer functioning as a sealant layer is formed on both of the surfaces of the paper substrate, one of which will become an inside surface of a packaging container (hereinafter referred to as "container inner surface") and the other of which will become an outside surface of the packaging container (hereinafter referred to as "container outer surface").

Numeral 31 denotes a sealer which is supported by a sealing apparatus body 33 through a bracket 32. The sealing apparatus body 33 is connected to an unillustrated air cylinder or the like so as to be advanced and retracted along a direction indicated by an arrow A by the air cylinder or the like.

10 The ultrasonic sealer 31 is composed of a horn 35, a converter 36 and a booster 37. Ultrasonic generated by the converter 36 is amplified by the booster 37, and the energy of the amplified ultrasonic waves is converged to the tip 35c. The horn 35 is composed of a rear square columnar portion 35a and a front converging portion 35b. The converging portion 35b is gradually flattened as approaching the tip 35c, and the tip 35c extends in a horizontal direction (in a direction perpendicular to the drawing) along the outer sealing fins 18.

15 In addition, an anvil 23 is disposed in front of the horn 35. When the horn 35 is advanced to its advanced position, the sealing fin portion 21 is pressed by the horn 35 toward the anvil 23 so that ultrasonic vibration is transmitted to the sealing fin portion 21. As a result, each pair of opposing sealant layers is fused and joined.

20 Further, in order to prevent the edge portion 25 of the sealing fin portion 21 from vibrating which may occur due to ultrasonic vibration transmitted to the sealing fin portion 21, an outside pusher 40 functioning as an ultrasonic vibration absorbing means is disposed along the horn 35. The outside pusher 40 is composed of a square tubular portion 40a and a flat portion 40b disposed along the converging portion 35b, and the tip 40c of the outside pusher 40 contacts the sealing fine portion 21 at a position between the tip 35c of the horn 35 and the edge portion 25 of the sealing fine portion 21, and extends in a horizontal direction (in a direction perpendicular to the drawing) along the tip 35c.

25 The tip 40c of the outside pusher 40 presses the sealing fin portion 21 against the anvil 23 in cooperation with the tip 35c of the horn 35.

30 When the ultrasonic sealer 31 is operated and ultrasonic vibration is then transmitted to the sealing fin portion 21, the sealing fin portion 21 is excited to transmit the vibration toward the edge portion 25. However, since the sealing fin portion 21 is pressed against the anvil 23 by the outside pusher 40, the vibration is absorbed by the outside pusher 40 so that the vibration does not reach the edge portion 25.

35 In the above-mentioned manner, the edge portion 25 is prevented from vibrating. Accordingly, it is possible to prevent the generation of dust from an end surface of the paper substrate which is exposed to the outside at

the edge portion 25 of the sealing fin portion 21.

The position of the tip 40c of the outside pusher 40 can be adjusted with respect to the position of the tip 35c of the horn 35. For this adjustment, a projection member 43 is fixed to the outside pusher 40, and an adjusting bolt 44 which is in screw engagement with the projection member 43 contacts the front end of the sealing apparatus body 33.

Further, a pair of elastic rings 46 are interposed between the square columnar portion 35a and the square tubular portion 40a, so that ultrasonic vibration in the horn 35 is prevented from being transmitted to the outside pusher 40.

Next, a second embodiment of the present invention will be described.

FIG. 7 is a schematic view of a main portion of a sealing apparatus for packaging containers according to the second embodiment of the present invention.

In FIG. 7, numeral 13 denotes a packaging container, numeral 21 denotes a sealing fin portion, numeral 35 denotes a horn, and numeral 50 denotes an anvil disposed in front of the horn 35. When the horn 35 is advanced to its advanced position, the sealing fin portion 21 is pressed by the horn 35 toward the anvil 50 so that ultrasonic vibration is transmitted to the sealing fin portion 21. As a result, each pair of opposing sealant layers is fused and joined.

Further, in order to prevent the edge portion 25 of the sealing fin portion 21 from vibrating which may occur due to ultrasonic vibration transmitted to the sealing fin portion 21, an elongated projection 50a functioning as an ultrasonic vibration absorbing means is formed on a surface of the anvil 50 facing to the horn 35. The projection 50a extends in a horizontal direction (in a direction perpendicular to the drawing) at a position between the tip 35c of the horn 35 and the edge portion 25. Accordingly, the sealing fin portion 21 is held between the projection 50a and the tip 35c, when the sealing fin portion 21 is pressed against the anvil 50 by the horn 35 located in its advanced position.

When the ultrasonic sealer 31 (see FIG. 5) is operated and ultrasonic vibration is transmitted to the sealing fin portion 21, the sealing fin portion 21 is excited to transmit the vibration toward the edge portion 25. However, since the sealing fin portion 21 is held between the projection 50a and the tip 35c, the ultrasonic vibration is absorbed by the anvil 50 through the projection 50a so that the vibration does not reach the edge portion 25.

In the above-mentioned manner, the edge portion 25 is prevented from vibrating. Accordingly, it is possible to prevent the generation of dust from an end surface of the paper substrate which is exposed to the outside at the edge portion 25 of the sealing fin portion 21.

Next, a third embodiment of the present invention will be described.

FIG. 8 is a schematic view of a main portion of a sealing apparatus for packaging containers according to the third embodiment of the present invention.

In FIG. 8, numeral 35 denotes a horn, and numeral 40 denotes an outside pusher disposed along the horn 35, acting as an ultrasonic vibration absorbing means. The outside pusher 40 has a square tubular portion 40a surrounding the square columnar portion 35a of the horn 35. In addition, a pair of elastic rings 46 are interposed between the square columnar portion 35a and the square tubular portion 40a, so that ultrasonic vibration in the horn 35 is prevented from being transmitted to the outside pusher 40.

Further, a support member 51 is fixed to the square tubular portion 40a and inwardly extends so that the tip of the support member 51 contacts the square columnar portion 35a. The position at which the tip of the support member 51 contacts the square columnar portion 35a is selected to correspond to a node of the standing wave of ultrasonic vibration transmitted to the horn 35. Since the outside pusher 40 supports the horn 35 through the support member 51, the bracket 32 shown in FIG. 5 can be eliminated.

The present invention is not limited to the above-mentioned embodiment. Numerous modifications and variations of the present invention are possible.

## INDUSTRIAL APPLICABILITY

The sealing apparatus for packaging containers according to the present invention can be applied to a device for manufacturing a gable-top type packaging container.

## Claims

1. A sealing apparatus for packaging containers, in which a square tubular carton (13) is folded along pleat lines and each pair of sealant layers of a sealing fin portion (21) facing each other is fused for sealing to form a gable-top type packaging container, said sealing apparatus comprising:
  - (a) an anvil (23, 50) for supporting said sealing fin portion,
  - (b) a horn (35) composed of a columnar portion (35a) and a converging portion (35b),
  - (c) means (32, 33, 36, 37) for pressing said sealing fin portion against said anvil through the tip (35c) of said horn and for transmitting ultrasonic vibration to said sealing fin portion; and characterized by
  - (d) ultrasonic vibration absorbing means (45, 50a) disposed such that, in use, it is located between the tip of said horn and the free edge portion (25) of said sealing fin portion and in contact with said sealing fin portion for absorbing ultrasonic vibration.
2. A sealing apparatus for packaging containers according to Claim 1, in which said ultrasonic vibra-

tion absorbing means is a projection (50a) which is formed on said anvil (50) for holding the packaging material in cooperation with the tip of said horn.

3. A sealing apparatus for packaging containers according to Claim 1, in which said ultrasonic vibration absorbing means is an outside pusher (40) which is disposed along the tip portion of said horn and which is pressed against said sealing fin portion.
4. A sealing apparatus for packaging containers according to Claim 3, in which said outside pusher is provided with a tubular portion (40a) surrounding said horn and a support member (51) which inwardly extends from said tubular portion for supporting the horn, and the tip of said support member contacts a portion corresponding to a node of standing wave of ultrasonic vibration transmitted to said horn.

#### Patentansprüche

1. Versiegelungsvorrichtung für Verpackungsbehälter, bei der ein viereckiger, rohrförmiger Karton (13) längs Falzlinien gefaltet wird und jedes Paar von einander zugewandten Versiegelungsschichten eines Versiegelungsrippenabschnitts (21) zur Versiegelung miteinander verschmolzen werden, um einen Verpackungsbehälter vom Typ mit giebelförmigem Oberteil zu bilden, wobei die Versiegelungsvorrichtung folgendes aufweist:
  - (a) einen Amboß (23, 50) zum Halten des Versiegelungsrippenabschnitts,
  - (b) ein Horn (35), das aus einem säulenförmigen Abschnitt (35a) und einem zusammenlaufenden Abschnitt (35b) besteht,
  - (c) Mittel (32, 33, 36, 37) zum Drücken des Versiegelungsrippenabschnitts gegen den Amboß über die Spitze (35c) des Horns und zum Übertragen der Ultraschallschwingung zu dem Versiegelungsrippenabschnitt; und gekennzeichnet durch
  - (d) eine Ultraschallschwingungs-Absorptions-einrichtung (40, 50a), die derart angeordnet ist, daß sie bei Verwendung zwischen der Spitze des Horns und dem freien Kantenabschnitt (25) des Versiegelungsrippenabschnitts und in Kontakt mit dem Versiegelungsrippenabschnitt liegt, um die Ultraschallschwingung zu absorbieren.
2. Versiegelungsvorrichtung für Verpackungsbehälter nach Anspruch 1, bei welcher die Ultraschallschwingungs-Absorptionseinrichtung ein Vorsprung (50a) ist, der an dem Amboß (50) ausgebildet ist, um das Verpackungsmaterial im

Zusammenwirken mit der Spitze des Horns zu halten.

3. Versiegelungsvorrichtung für Verpackungsbehälter nach Anspruch 1, bei welcher die Ultraschallschwingungs-Absorptionseinrichtung eine äußere Schubeinrichtung (40) ist, die entlang des Spitzenabschnitts des Horns angeordnet ist und gegen den Versiegelungsrippenabschnitt gedrückt wird.
4. Versiegelungsvorrichtung für Verpackungsbehälter nach Anspruch 3, bei welcher die äußere Schubeinrichtung mit einem rohrförmigen Abschnitt (40a) versehen ist, der das Horn und ein Stützelement (51) umgibt, das sich von dem rohrförmigen Abschnitt nach innen erstreckt, um das Horn zu stützen, und die Spitze des Stützelements mit einem Abschnitt in Kontakt steht, der einem Wellenknoten der stehenden Welle einer zu dem Horn übertragenen Ultraschallschwingung entspricht.

#### Revendications

1. Appareil de fermeture étanche pour récipients d'emballage dans lequel un carton tubulaire carré (13) est plié le long de lignes de pliage et chaque paire de couches de produit de fermeture étanche d'une partie d'ailettes de fermeture étanche (21) se faisant face est portée à fusion pour réaliser une fermeture étanche pour former un récipient d'emballage du type à partie supérieure en dos d'âne, le dit appareil de fermeture étanche comprenant :
  - (a) une enclume (23,50) pour supporter la dite partie d'ailettes de fermeture étanche,
  - (b) une corne (35) constituée d'une partie en colonne (35a) et d'une partie convergente (35b),
  - (c) un dispositif (32,33,36,37) pour presser la dite partie d'ailettes de fermeture étanche contre la dite enclume par l'intermédiaire du sommet (35c) de la dite corne et pour transmettre une vibration par ultrasons à la dite partie d'ailettes de fermeture étanche ; et caractérisé par
  - (d) un moyen d'absorption de vibration par ultrasons (40,50a) disposé de telle façon que, en utilisation, il soit placé entre le sommet de la dite corne et le bord libre (25) de la dite partie d'ailettes de fermeture étanche, et en contact avec la dite partie d'ailettes de fermeture étanche, pour absorber les vibrations par ultrasons.
2. Appareil de fermeture étanche pour récipients d'emballage selon la revendication 1, dans lequel le dit dispositif d'absorption de vibration par ultrasons est constitué par une saillie (50a) qui est formée sur

la dite enclume (50) pour maintenir le matériau d'emballage en coopération avec le sommet de la dite corne.

3. Appareil de fermeture étanche pour récipients d'emballage selon la revendication 1, dans lequel le dit dispositif d'absorption de vibration par ultrasons est constitué par un poussoir extérieur (40) qui est disposé le long de la partie supérieure de la dite corne et qui est pressé contre la dite partie d'ailettes de fermeture étanche. 5

4. Appareil de fermeture étanche pour récipients d'emballage selon la revendication 3, dans lequel le dit poussoir extérieur est pourvu d'une partie tubulaire (40a) entourant la dite corne et d'un élément de support (51) qui se prolonge vers l'intérieur depuis la dite partie tubulaire pour supporter la corne, et la pointe du dit élément de support engage une partie correspondant à un noeud d'onde stationnaire de vibration par ultrasons transmise à la dite corne. 15 20

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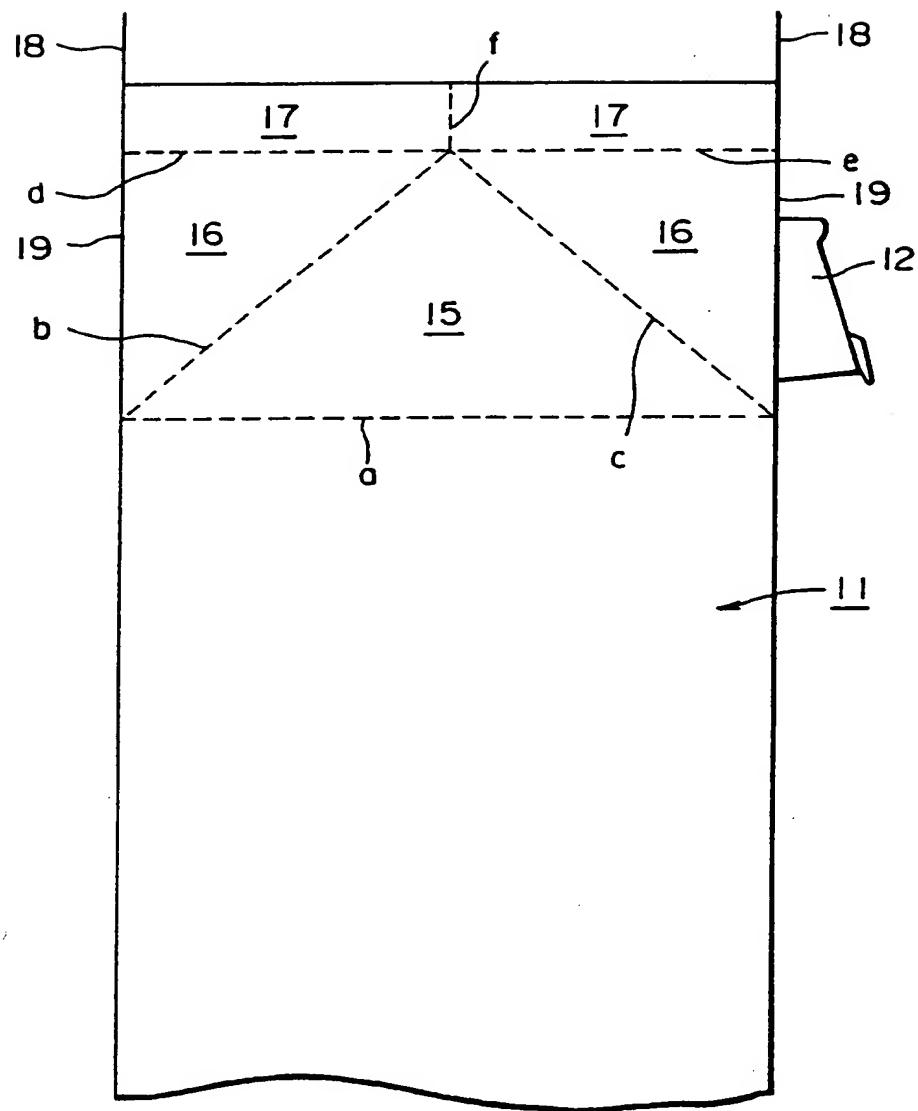
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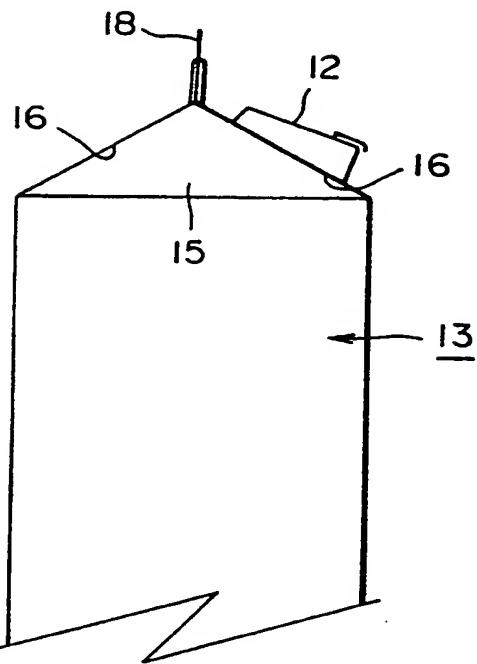
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FIG. I



**FIG. 2**



**FIG. 3**

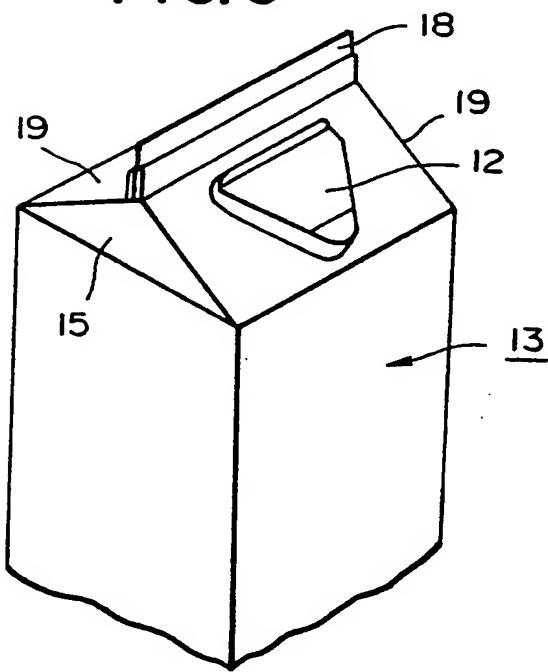


FIG. 4

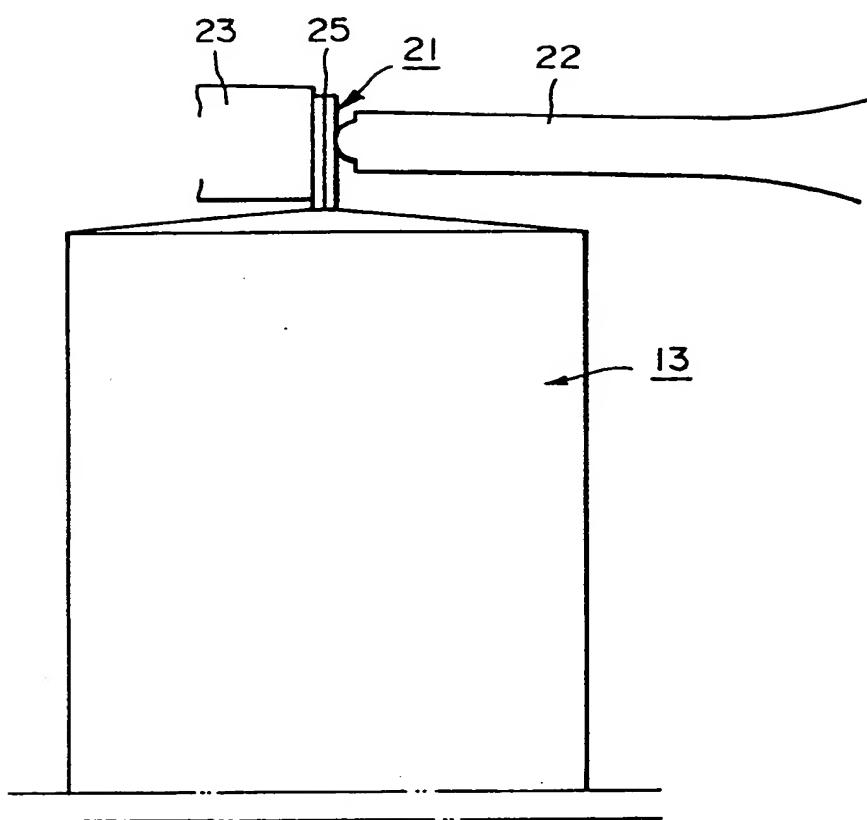


FIG. 5

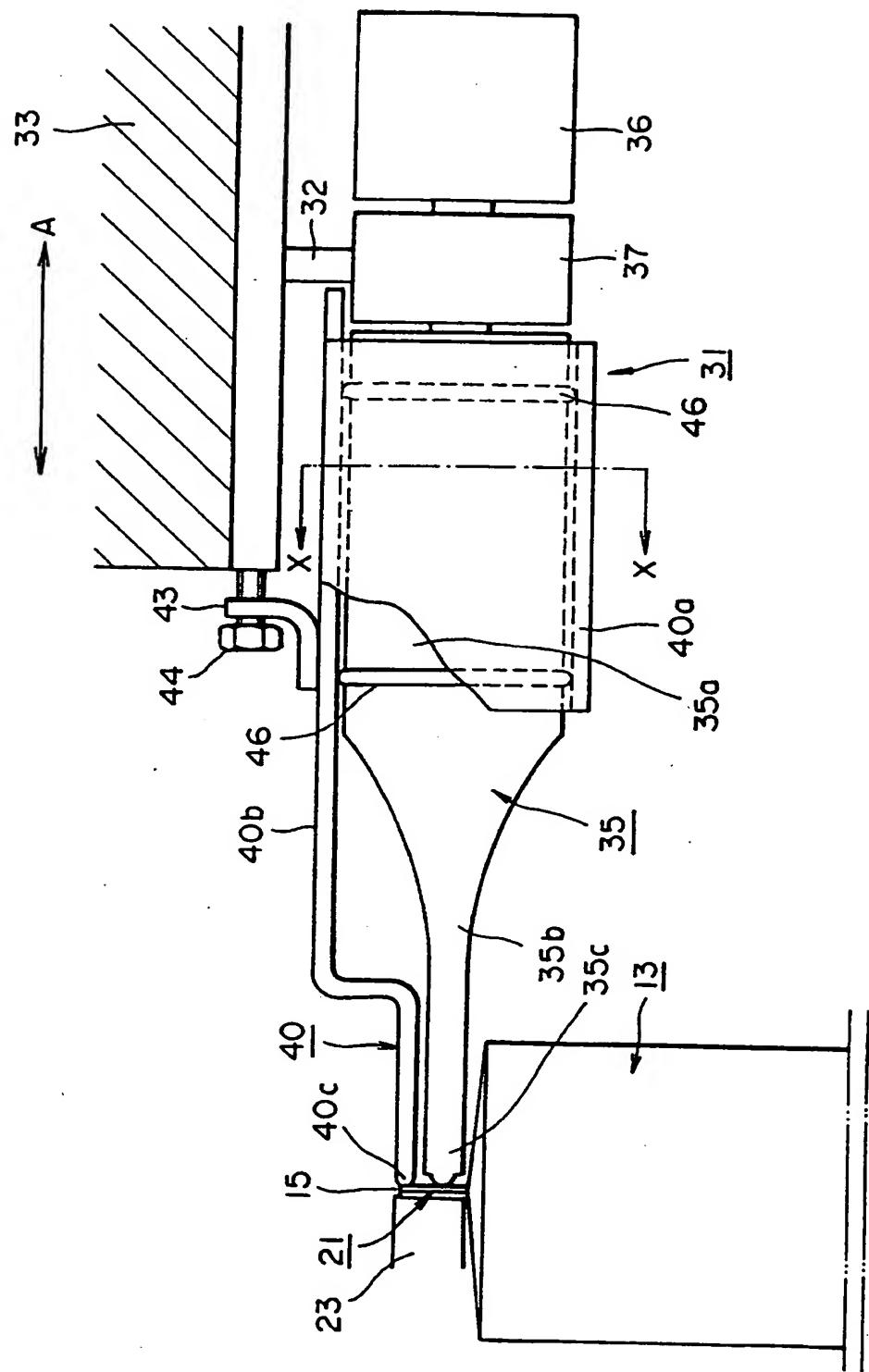


FIG. 6

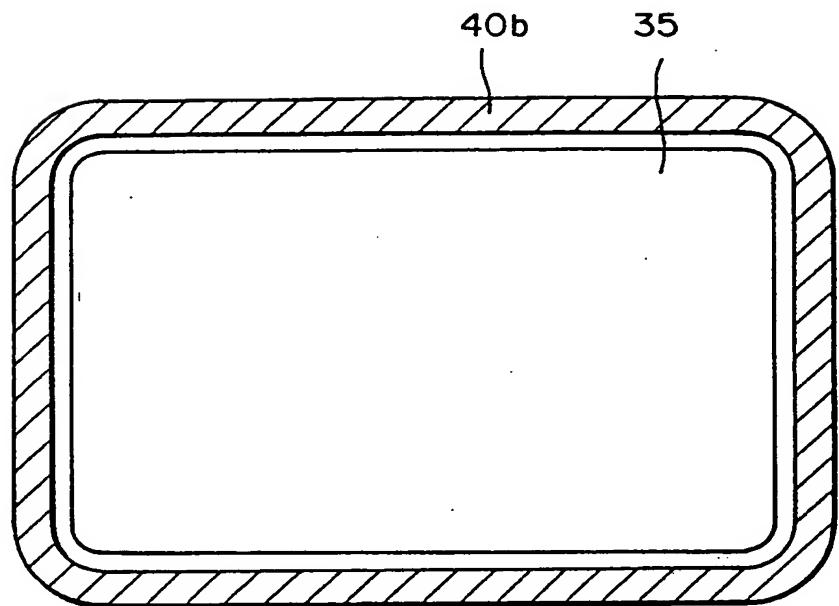


FIG. 7

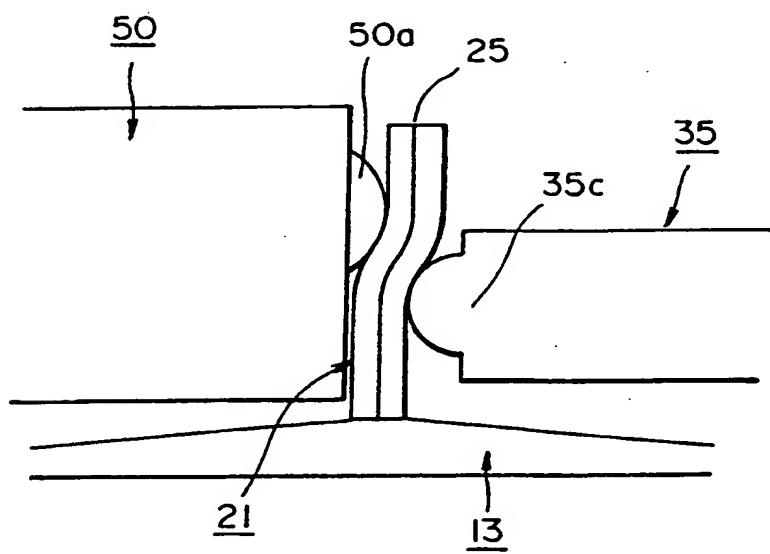


FIG. 8

